

REMARKS

Claim 1-19 and 43-51 are pending. Claims 1, 2, 10, 11, 16, and 43-51 have been amended.

Objections to Specification

The Examiner has objected to the specification as failing to provide proper antecedent basis for the claimed subject matter of claims 45-48. Examiner has noted that it was not clear what specific material is being claimed (SiGe, SiC, etc.). Applicant has amended claims 45-48 to indicate the material is a “semiconductor” to more clearly articulate the invention and respectfully requests the Examiner to consider the portions of the specification highlighted by Applicant.

Applicant wishes to note that the independent claim 44 requires the specified structural regions to be formed from semiconductor materials having “different” lattice constants as specified in Applicant’s paragraphs 0032 and 0036. Dependent claims 45-48 then merely claim how the structural members of claim 44 are different by defining their relative material lattice constants.

In support of claims 45 and 46, the specification states, “the single crystalline semiconductor film 316 has a larger lattice constant or lattice size than the underlying semiconductor substrate 300,” and “the single crystalline semiconductor film 316 has a smaller lattice size or constant than the underlying semiconductor substrate.” (Applicant’s paragraph [0032], referring to Fig. 3E). Applicant also notes that Applicant’s paragraph 0025 teaches that various semiconductor substrates can be utilized in embodiments of the present invention (SiGe, Si, Ge, GaAs, etc.) and Applicant also describes specific embodiments with SiGe and SiC for the semiconductor bodies (paragraph 0033).

In support of claims 47 and 48, the specification states, “semiconductor capping layer 210 is formed of a semiconductor material having a different lattice constant than the semiconductor body 208 so that a strain is formed in the capping layer...the capping layer has a tensile strain [or] the capping layer has a compressive strain” (Applicant’s paragraph [0016], referring to Fig 2). Applicant then describes in the specification two specific embodiments, 1) a tensile stressed capping layer having a smaller lattice constant than the

semiconductor body and, 2) a compressive stressed capping layer having a larger lattice constant than the semiconductor body. Specifically, Applicant describes a first embodiment where a “single crystalline silicon film formed on a silicon-germanium alloy semiconductor body 208 will cause the single crystalline silicon film to have a tensile stress.” Applicant then describes in specification another embodiment where a “single crystalline capping layer 210 formed on a silicon-carbon alloy semiconductor body 208 will cause the single crystalline silicon film 210 to have a compressive stress.” (Applicant’s paragraph [0017]). Applicant submits it is well known within the art that all SiGe binary semiconductors have a lattice constant larger than that of silicon, supporting Applicant’s claim 48. Similarly, it is well known within the art that SiC semiconductors have a lattice constant smaller than that of silicon, supporting Applicant’s claim 47.

Because Applicant’s specification teaches the purpose for using these various materials in these specific combinations in paragraphs [0033] and [0017], it is Applicant’s position that the original disclosure is sufficient detail to teach one of ordinary skill in the art given the predictability of crystallographic materials science. As it is well known in the art that various semiconductor materials can be grown (especially upon the III-V substrate embodiments originally disclosed), claims 45-48 have been drafted to claim the essence of the present inventive structure without obscuring the invention with a list of the many possible combinations of materials from which one could fabricate a structure having the relatively *different* lattice constants as claimed by the Applicant.

Claim Rejections - 35 U.S.C. §112

The Examiner has rejected claims 49-50 for indefiniteness. Applicant has amended claims 49-50 to correct the insufficient antecedent basis.

Claim Rejections - 35 U.S.C. §103

The Examiner has rejected claims 1-8, 10, 12-19 and 44-51 under 35 U.S.C. § 103 as being unpatentable over Sugiyama et al. (US 2003/0227036) in view of Liu et al. (US 2004/0195624). The Examiner has also rejected claim 9 under 35 U.S.C. § 103(a) as being unpatentable over Sugiyama et al and Liu et al. in view of Figure 1A of the acknowledged prior art (APA).

Claims 1-9, 44-50

It is Applicant's position that the Sugiyama and Liu combination does not teach all of the features of Applicant's invention as claimed in independent claims 1 and 44. As amended, independent claims 1 and 44 teach and claim devices having a semiconductor capping layer over a semiconductor body formed on an active region of a bulk semiconductor substrate, wherein the active region of the bulk semiconductor substrate is adjacent to an isolation region of the bulk substrate. Applicant submits that an SGOI substrate and a bulk semiconductor substrate are not "equivalent" because Applicant's device on a bulk substrate has the additional structural feature of adjacent isolation.

The Examiner has noted that Lui states "the method for manufacturing strained Si is to deposit a Si layer on a relaxed SiGe buffer layer which can be deposited on a ... SGOI (silicon-on-SiGe-on insulator), or on a traditional bulk Si substrate." (Liu, paragraph [0003]). Applicant notes however, that if either the Sugiyama isolation layer 20 or Liu isolation layer 31 was instead merely part of a bulk substrate as the Examiner suggests, there would be no substrate isolation provided for in such a device (referring to Sugiyama Fig. 2) and it is not obvious how such isolation would be formed since both cited references are silent on this inventive aspect.

In contrast, Applicant's invention as claimed has "a semiconductor body on an active region of a bulk semiconductor substrate" and "an isolation region on said bulk semiconductor substrate, said isolation region adjacent to said active region." This amendment is supported by the original disclosure as the active and isolation regions are

depicted by 312 and 308, respectively, in Figure 3I and further described in Applicant's paragraph 0025.

Because any combination of the Sugiyama and Liu disclosures would eliminate the only substrate isolation disclosed by the cited references, it is Applicant's position that the cited references fail to teach all of the elements of Applicant's claimed invention. Applicant respectfully disagrees with the Examiner's statement that SGOI substrates and bulk substrates are considered "equivalents" because the starting material has a substantial impact on the problems that must be solved in the design of the final device. For example, the formation of the semiconductor body and this body's placement adjacent to the substrate isolation regions of a bulk substrate is non-trivial. Because both the Sugiyama and Liu devices utilized SGOI starting material, neither of these considerations were addressed in the disclosures of the cited references. It is therefore Applicant's position that it is not obvious how to modify the Sugiyama device on the basis of the Liu disclosure to achieve all the features of Applicant's claimed device.

Applicant understands dependant claims 2-9 and 45-50 are also nonobvious for at least the same reason as for independent claims 1 and 44. On this basis, Applicant respectfully requests removal of the 35 U.S.C. 103 rejection of claims 1-10 and 44-50.

Claims 10-15, 16-19

Independent claims 10 and 16 have been amended to specify the isolation region is adjacent not only to the active area of the bulk substrate as in claim 1, but is also adjacent to a portion of the semiconductor body formed on the active area, as depicted in the original specification in Figure 2 (region 204 is next to region 208) and Figure 3I (region 312 is next to region 318). This additional feature is not found in or suggested by the Sugiyama or Liu references. Applicant understands dependant claims 11-15 and 17-19 are also nonobvious for at least the same reason as for independent claim 1. On this basis, Applicant respectfully requests removal of the 35 U.S.C. 103 rejection of claims 10-19.

Claim 51

Claim 51 has been amended to require a limitation of a thicker semiconductor cap on the top of the semiconductor body than on the sidewalls of the semiconductor body, similar to allowed claim 43.

Allowable Subject Matter

The Examiner has indicated that claim 43 is allowed. Applicant has corrected an informality present in both allowed claim 43 and in objected claim 11.

Applicant respectfully submits that in view of the arguments set forth herein, the applicable rejections have been overcome and the present application is in condition for allowance.